



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
REGION 6  
1445 ROSS AVENUE, SUITE 1200  
DALLAS, TEXAS 75202 – 2733

October 10, 2017

CERTIFIED MAIL -- RETURN RECEIPT REQUESTED – 7004 1160 0003 0358 5290

Ms. Lori Wrotenbery, Director  
Oil and Gas Division  
Railroad Commission of Texas  
P.O. Box 12967  
Austin, Texas 78711-2967

Dear Ms. Wrotenbery:

This letter transmits EPA's end-of-year evaluation (EOY) of the Texas Underground Injection Control (UIC) program implemented by the Railroad Commission of Texas (RRC) for State Fiscal Year 2016. EPA's last evaluation of the RRC's UIC program covered Fiscal Years 2010 through 2015. The RRC provided comments on our draft EOY transmitted on July 25, 2017, to Mr. David Hill, RRC's UIC manager, via emails received on August 14 and 25, 2017; our final EOY report incorporates those comments and suggest changes.

We wish to thank you and your staff for your work in protecting underground sources of drinking water from underground injection activities under your authority. Of particular note, the decrease in the level of seismicity in North Texas from 2015 to 2016 was profound. We commend you and your staff for all RRC actions taken to accomplish this reduction. We look forward to working with you to resolve our oversight issues outlined in the enclosed report. Our technical expertise remains available on request.

If you wish to discuss any aspect of this EOY evaluation, please call me at (214) 665-7101, or you or your staff may contact Mr. Philip Dellinger at (214) 665-7150. If your staff has specific questions about UIC grant performance, please contact Mr. Michael Vaughan at (214) 665-7313 or Mr. Mike Frazier at (214) 665-7236, for questions regarding EPA's program oversight.

Sincerely yours,

A handwritten signature in blue ink, appearing to read "WK Honker", is written over the typed name.

William K. Honker, P.E.  
Director  
Water Division

Enclosure

cc: Leslie Savage, RRC Chief Geologist, w/encl.  
David Hill, RRC UIC Manager, w/encl.

**FISCAL YEAR 2016  
EPA REGION 6 END-OF-YEAR EVALUATION  
RAILROAD COMMISSION OF TEXAS  
UNDERGROUND INJECTION CONTROL PROGRAM**

**Introduction**

Under Safe Drinking Water Act (SDWA) Section 1425 authority, EPA approved the Railroad Commission of Texas (RRC) Underground Injection Control (UIC) primacy enforcement responsibility for Class II oil and gas related injection wells in 1982. EPA later approved RRC's primacy UIC program for Class III brine mining wells and energy related Class V injection wells under SDWA Section 1422.

As part of the EPA/RRC primacy agreements, EPA Region 6 retains oversight responsibilities that includes an annual end-of-year evaluation. This annual oversight report summarizes RRC activities during State Fiscal Year (FY) 2016 in fulfillment of its primacy program and Federal UIC grant and workplan commitments. The Texas State Fiscal Year begins on September 1 and ends on August 31 each year.

**Section 1.0 FY2016 Grant Workplan**

Pursuant to receiving federal financial assistance through SDWA Part C authorization, the RRC submits and EPA approves an annual grant application and associated workplan that outlines goals, expected milestones for key program activities, and estimated funding toward achieving those goals and milestones. The grant application and workplan for FY2016 were approved by Region 6 on July 1, 2015.

**Section 1.1 FY2016 Grant Award and Allocation**

The federal FY2016 grant allotment for the Texas Railroad Commission's (RRC) UIC program was \$633,080 in UIC programmatic funds; these funds are determined annually based on the annual well inventory numbers submitted by State UIC Primacy programs upon EPA request near the end of each calendar year. In addition, the RRC received \$25,195 in UIC special project funds during FY2016 to support RRC's scanning of H-5s, mechanical integrity test reports. Note: During FY2017, EPA awarded RRC approximately \$39,400 in special project funds to support hiring a geologist to review state records to identify injection wells in aquifers that may be considered exempted aquifers.

**Section 1.2 Grant Deliverables**

Pursuant to EPA regulations and policies, environmental programs conducted on behalf of EPA will establish and implement effective quality systems. Correspondingly, the State program's Quality Management Plan (QMP) and Quality Assurance Project Plan (QAPP) must be validated annually. If both the QMP and QAPP are current and valid, EPA requires

each state to certify annually that both plans are current by submitting updated signatory pages and organizational charts as applicable. The FY2016 QMP [QTRAK #16-285] was approved by Region 6 on 6/24/2016, and expires on 01/01/2018. The FY2016 UIC QAPP [QTRAK #17-041] was approved by Region 6 on 11/07/2016, and expires on 11/07/2017. Table 1 includes the workplan due dates and date of receipt for documents submitted by RRC as specified in the grant workplan.

**Table 1. Grant deliverables in FY2016 UIC Workplan.**

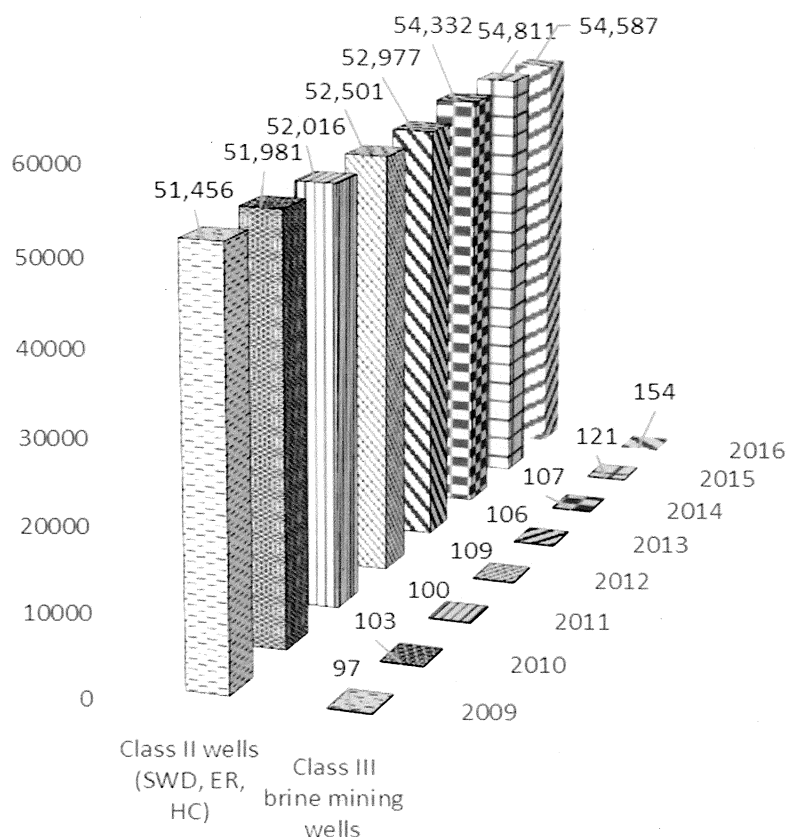
<b>Grant Deliverable</b>	<b>Due Date</b>	<b>Date Received</b>
Quarterly Reports (EPA Forms 7520)	4/30/2016 10/31/2016	Submitted on time
FY2016 Grant Application FY2016 Grant Workplan	7/01/2016	Application received- 6/08/2016 Workplan received- 6/08/2016 Approved - 07/2016
Final Financial Status Report (FY16)	11/30/2016	The Final FSR was reviewed and processed on 12/01/2016. The grant is closed.
Annual UIC Program Report (FY16)	10/31/2016	10/18/2016
Update on Program, Regulatory or Statutory Changes	10/31/2016	10/18/2016
Annual QMP/QAPP Updates*	QMP	Received- 6/13/2016 Approved- 6/24/2016 Expires- 01/01/2018
	UICQAPP	Received- 11/2016 Approved- 11/7/2016 Expires- 11/7/2017
UIC Well Inventory for FY16	12/18/2016	11/2016

\* The Quality Management Plan (QMP) and Quality Assurance Project Plan (QAPP) are updated annually.

## Section 2 Inventory

Chart 1 illustrates the number of injection wells reported by class to EPA annually by the RRC from 2009 through 2016; the State UIC program annual inventory numbers are usually submitted during or near December each year. These values (along with values reported by other State and EPA UIC programs) are used by EPA to calculate the annual grant funds allocated to each State UIC program.

Chart 1. Annual well inventory by well class 2009-2016



Previous inventory requests from EPA specified total number of Class II wells and number of Class III sites and wells. In 2016, EPA requested a breakdown of Class II salt water disposal (SWD) and enhanced recovery (ER) wells (13,418 and 40,421, respectively), totaling 53,839 injection wells. The number of hydrocarbon storage (HC) wells regulated by RRC are usually included in the requested inventory, but were not requested by EPA in 2016. RRC reports a total of 748 HC storage wells for 2016. The total Class II injection well inventory used in this report includes all three types of wells, SWD, ER, and HC, 54,587, a decrease of 224 wells from the values reported in 2015. The number of Class III brine mining wells in 2016 increased by 33 wells.

Since inception, the RRC UIC program remains the nation's largest Class II program based on the total number of Class II injection wells reported annually. Injection wells used in natural gas

storage operations are also regulated by the RRC, but are specifically excluded from regulation under the SDWA and not subject to EPA UIC oversight.

In addition to the annual UIC well inventory, the RRC also provides well inventory values in their annual narrative report as stipulated in their UIC grant workplan; the well inventory value in the narrative report appears to include all types of injection wells, Class II, III, and possibly V, based on the larger numbers. Those inventory numbers are not used in this report. The RRC annual narrative report for State Fiscal Year 2016 is attached to this annual evaluation as Appendix I.

### **Section 3.0 Key Program Activities**

This section includes an evaluation of key program measures as reported annually to EPA by the RRC through EPA's Forms 7520 and the annual narrative required in the annual UIC grant workplan. The charts in this section includes information submitted by the RRC from 2009 through 2016.

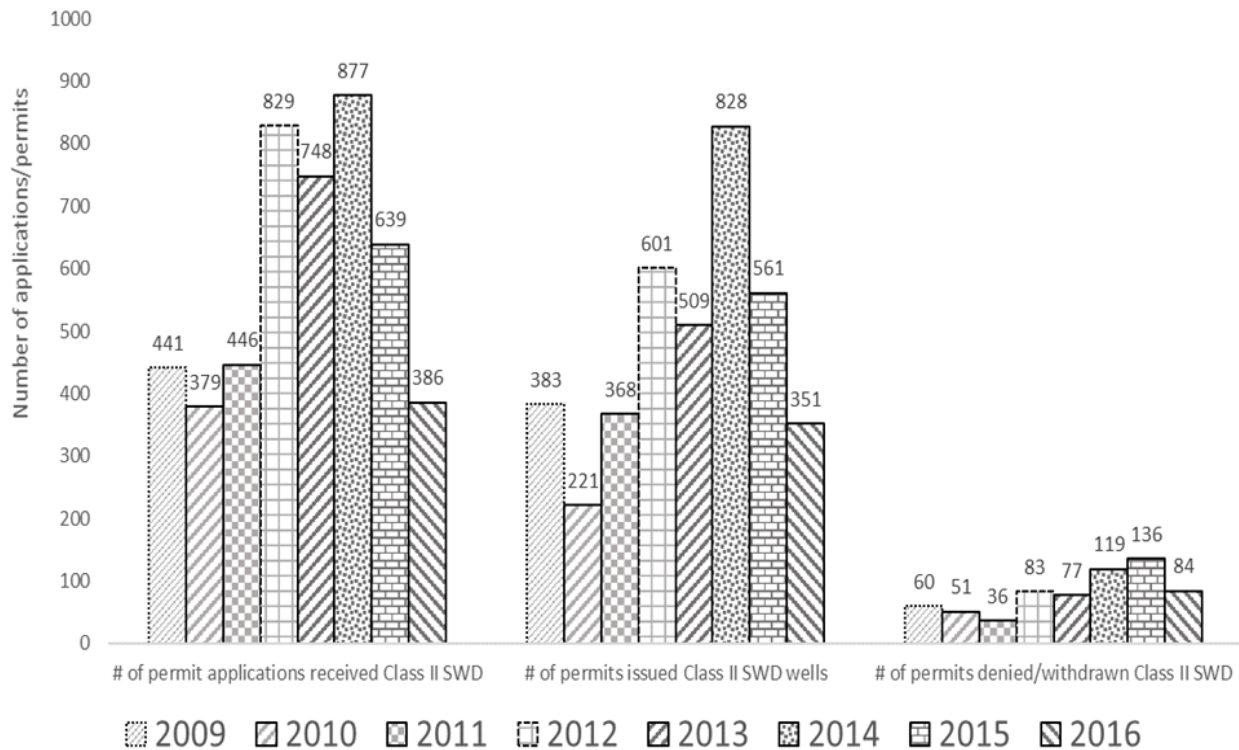
#### **Section 3.1 Permitting**

The previous Section 2 includes information on permitted wells regulated by the RRC. All injections wells authorized by the RRC are authorized through RRC permits. There are no authorized-by-rule injection wells regulated by the RRC. Chart 2 presents the number of Class II UIC permit applications received for salt water disposal (SWD), the number of new Class II SWD UIC permits issued, and the number of SWD UIC permit applications either denied or withdrawn from 2009 through 2016, and also includes applications to amend existing permits. The number of permit applications received increased in 2012 by about 85 percent from 2011 numbers, remains relatively constant during 2013 and 2014 and declines approximately 27 percent in 2015; that same decline is not reflected in the number of permit applications denied or withdrawn in 2015.

#### **Section 3.2 Annual UIC Operator Reports**

As part of their UIC surveillance, the RRC requires operators of injection wells to complete and submit Form H-10 annually; Form H-10 includes specific well identification information and monthly measurements of injection pressures, injected volumes, and casing/tubing annulus pressures. Chart 3 illustrates the annual Class II well inventory graphed with the number of annual monitoring reports submitted by operators for Class II injection wells (SWD, ER, and HC) since 2009. During the last eight annual reporting periods included in this report, the RRC received and reviewed annual reports of almost 97 percent of all Class II permitted injection wells. The annual numbers of H-10s received and reviewed were taken from the RRC's annual narrative report which is based on the State FY period, September 1 through August 31, while the Class II inventory values throughout this report were taken from annual well inventory report submitted annually to EPA.

Chart 2. Reported number of permit applications received/issued/denied or withdrawn for Class II Salt Water Disposal wells 2009-2016



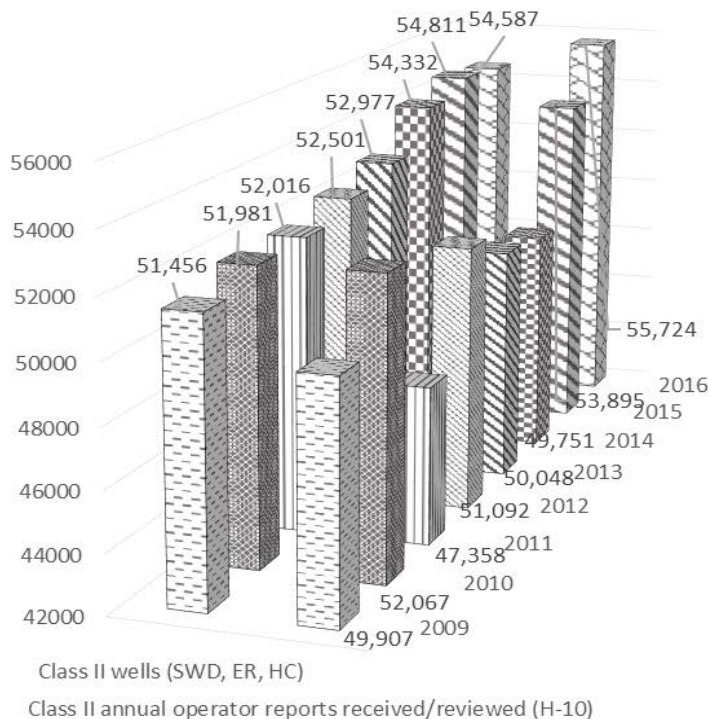
For this reason, comparing Class II well inventory and operator annual monitoring reports is an approximation because the data represent different time periods; both values are dynamic. During FY2010 and FY2016, the numbers of reported H-10s were higher than the reported Class II inventory values, greater than 100 percent. When the number of wells for which the operators of record did not submit a form H-10 is lower than the normal high around 97 percent, the lower values are likely caused by operators going out of business or wells being either transferred, plugged, or abandoned.

### Section 3.3 Class II Injection Well Inspections, Mechanical Integrity Testing, and Enforcement

For Class II wells, Chart 4 compares the annual inventory with the number of wells inspected, number of routine/periodic inspections, and number of inspections in response to emergencies or complaints. From 2009 through 2015, the average number of inventoried Class II injection wells inspected for compliance in the field was near 57 percent, with the lowest percentage of about 49 percent in 2015. Based on the reported values, more than half of the reported number of authorized injection wells in Texas are inspected annually, and from Chart 3, the RRC collects and reviews operator-submitted monitoring information of approximately 97 percent of the Class

II well inventory annually. Those numbers assure more than adequate inspection and monitoring surveillance actions. Chart 4 values were taken from submitted Forms 7520 for the annual Federal reporting period ending September 30.

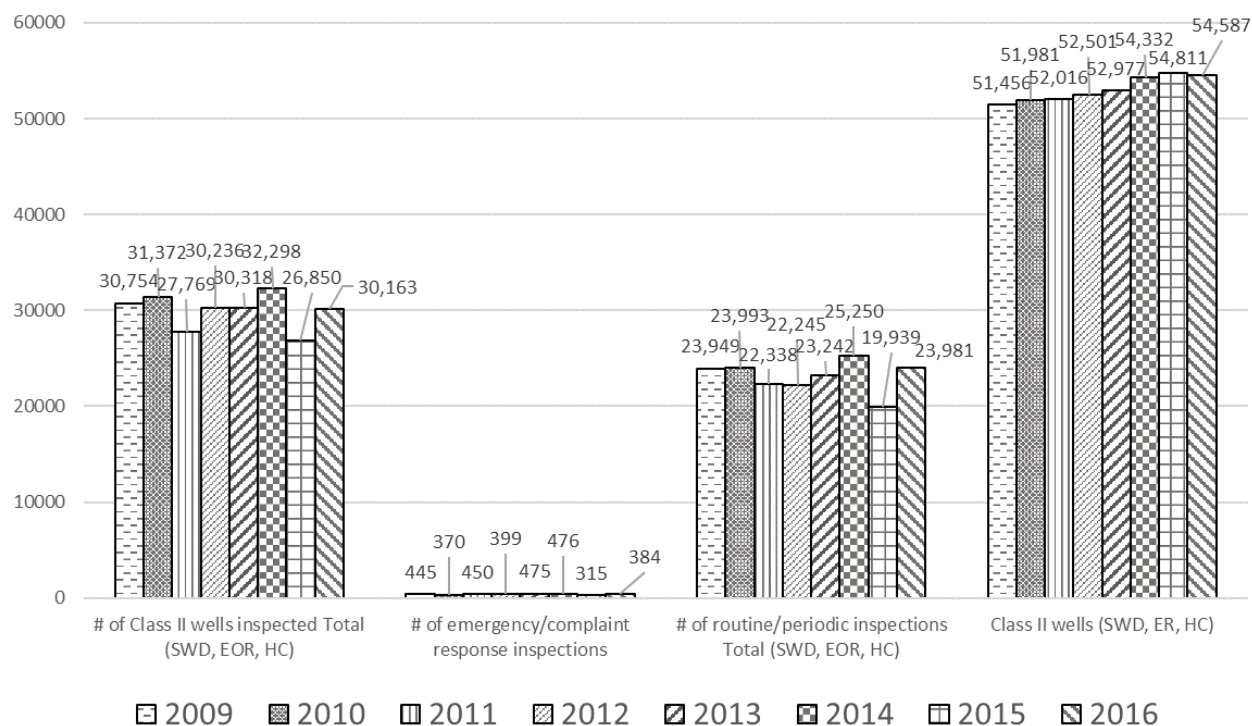
Chart 3. Class II well inventory and number of operator annual reports received and reviewed 2009-2016



For this reason, comparing Class II well inventory and operator annual monitoring reports is an approximation because the data represent different time periods; both values are dynamic. During FY2010 and FY2016, the numbers of reported H-10s were higher than the reported Class II inventory values, greater than 100 percent. When the number of wells for which the operators of record did not submit a form H-10 is lower than the normal high around 97 percent, the lower values are likely caused by operators going out of business or wells being either transferred, plugged, or abandoned.



Chart 4. Class II well inventory, wells inspected, routine/periodic inspections, and emergency/complaint response inspections 2009-2016

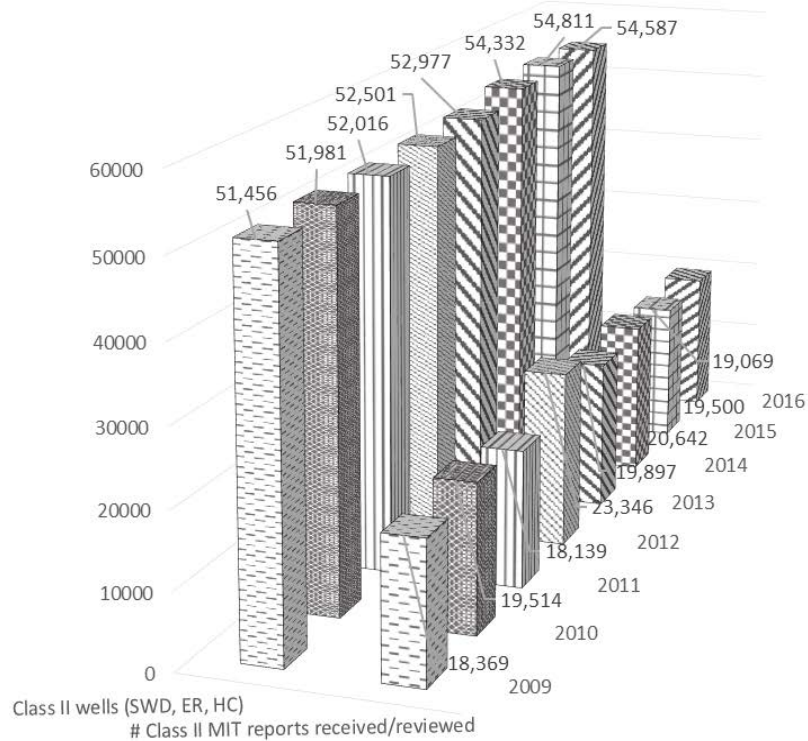


Most of the reported inspections are performed as routine or periodic injection well inspections. On average, inspections performed under emergency or complaint response conditions comprise just over 1 percent of all Class II inspections (2,930 of 209,597 from 2009-2015; in 2016—0.7%). The 2016 reported values continue to reflect an outstanding enforcement monitoring program.

The most important indicator of ground water protection in any UIC program is the mechanical integrity testing program, or MIT. A properly conducted MIT evaluates the condition of the well casing, tubing and packer to assure acceptable operating conditions. In most cases, an MIT is a pressure test of the casing/tubing annulus and the associated packer; a test failure may indicate a pathway for injected fluid to move out of the well into an underground source of drinking water. This procedure is required at least every five years for Class II wells; in some cases, more frequent testing is required as a permit condition in older enhanced recovery wells and a small number of older disposal wells. Chart 5 shows the number of Class II MIT reports received and reviewed by the RRC compared to the inventory of Class II wells from 2009-2016.



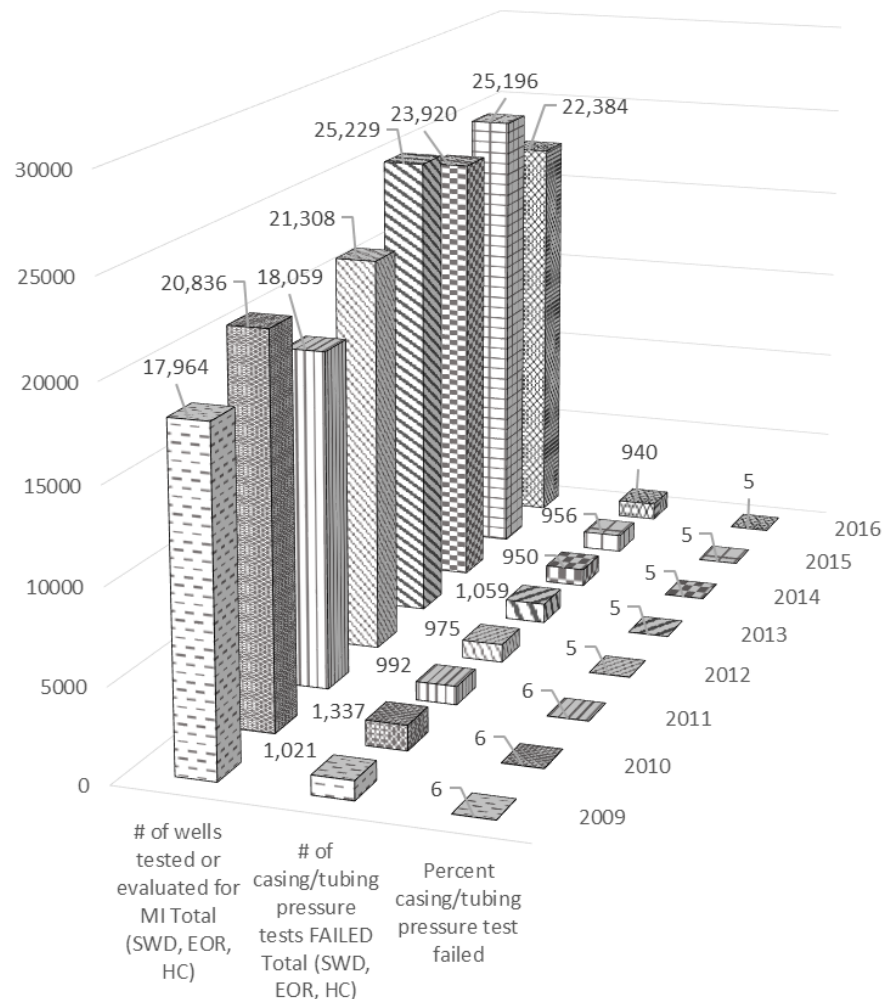
Chart 5. Class II well inventory and number of mechanical integrity test reports received and reviewed 2009-2016



On average since 2009, the number of injection wells tested for mechanical integrity annually equals about 37 percent of the reported annual inventory of Class II wells, with the greatest frequency, 45 percent, reported for 2012. The 2016 values represent 36 percent of the Class II inventory tested. In summary, these MIT values indicate that over one-third of the reported annual inventory of Class II wells are likely tested for mechanical integrity annually. Based on these reported MIT values, the RRC testing and surveillance program exceeds the minimum performance measure.

Chart 6 illustrates the number of wells reported by the RRC through the annual Forms 7520s for the number of Class II wells tested for mechanical integrity and the number that failed casing/tubing pressure testing from 2009 through 2016. Other MIT evaluations may include cement record evaluations and geophysical logging techniques including radioactive tracer surveys, temperature or noise logs, and oxygen activation logs.

Chart 6. Number of Class II wells tested for mechanical integrity and number that failed testing 2009-2015

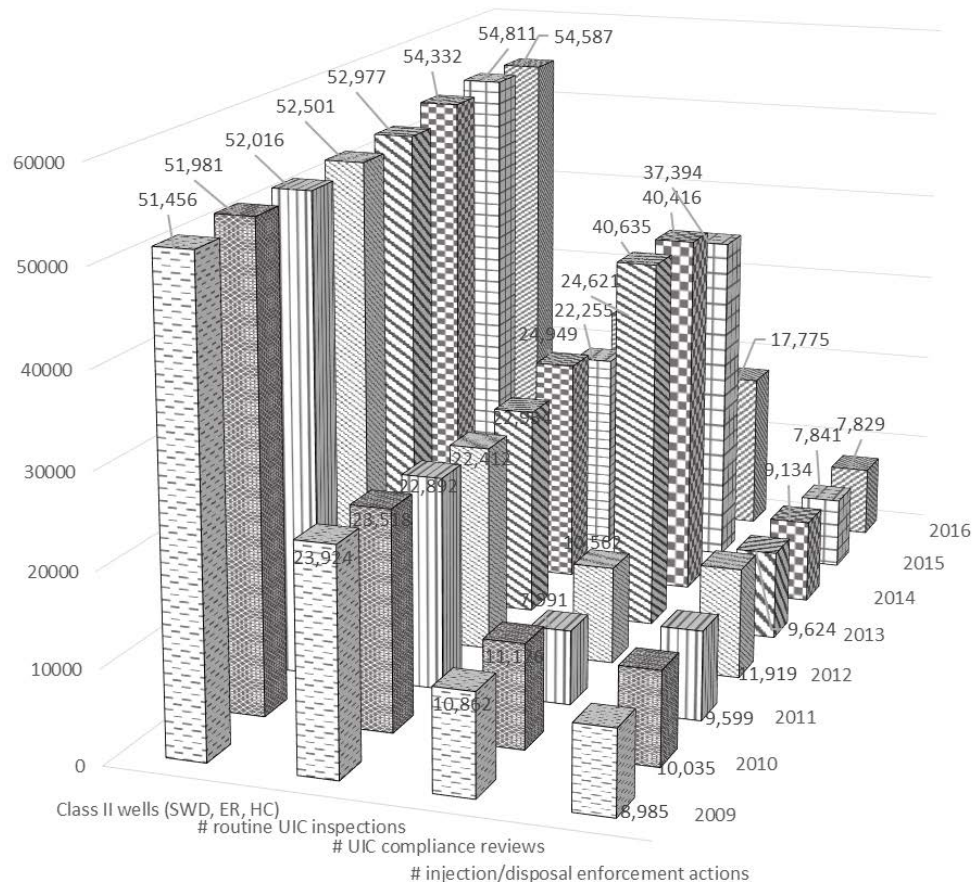


Since 2009, the percentage of MIT failures reported by the RRC ranges between 4 and 7 percent of the Class II wells tested; 5 percent in 2016. This failure rate is consistent with other State Class II UIC programs in Region 6.

Most Class II State UIC programs strive toward inspecting all their wells at least annually to assure proper surface operations and monitor for any pressure related issues. Chart 7 compares the number of routine UIC inspections, compliance reviews and enforcement actions with the annual reported Class II well inventory. The inspections, compliance reviews, and enforcement actions values were taken from the RRC's annual narratives from 2009 through 2016, not from EPA Forms 7520 as in Chart 4. Based on these data, approximately 44 percent of Class II injection wells undergo routine UIC inspections annually. Prior to 2013, the RRC reports show

approximately 20 percent of Class II wells were reviewed for compliance with applicable State UIC requirements; beginning in 2013, the number of previously reported Class II compliance reviews increased approximately 300 percent to over 37,000 in 2015. During FY2016, the RRC found these higher values were likely miscalculated (David Hill, personal communication, July 14, 2017). The corrected FY2016 compliance review number is over 17,000; RRC believes the previous three year values are in error, but will not be changed from previous reports.

Chart 7. Number of Class II wells inventory, number inspected, number reviewed for compliance, and number with enforcement actions 2009-2016



The number of Class II enforcement actions from 2009 through 2016 range from under 8,000 in 2015 to almost 12,000 in 2012, with 7,829 reported in 2016, approximately 32 percent of injection wells inspected last fiscal year. Chart 7 values were taken from the RRC annual narrative for FY2016 ending annually August 31.

Based on the information provided by the RRC, EPA Region 6 believes the State UIC program compliance surveillance and enforcement program for Class II and III injection wells regulated by the RRC appears effective. A summary of focused oversight matters make up the remainder of this evaluation.

## **Section 4.0 Current Oversight Issues**

In its FY2016 evaluation, EPA Region 6 focused on three primary UIC program concerns:

1. Increased seismic activity related to authorized Class II disposal,
2. Apparent formation pressure increases in East Texas associated with authorized Class II disposal, and
3. Identification and delineation of aquifers exempted at Class II program primacy in 1982, and any aquifers exempted by the RRC since 1982 related to oil and gas operations.

### **Section 4.1 Seismic Activity Related to Class II Disposal Injection**

In its FY 2015 report, EPA expressed concern of the large number of earthquakes in North Texas in 2015. During 2016, the number of recorded seismic events in North Texas dramatically decreased. EPA highly commends the RRC for its actions to address this situation, including implementation of changes in permitting and operation requirements through amended RRC Rules 9 and 46. These regulatory changes solidify RRC authority regarding seismicity related to Class II disposal, include new reporting and operational requirements for operators, and establish new permit application information to address seismic risk.

### **Section 4.2 East Texas Formation Pressure Increases Related to Class II Disposal**

A large volume of produced brine in East Texas is injected underground into authorized Class II disposal wells. Many of those wells are permitted commercial facilities that receive exploration and production (E&P) oilfield wastes produced from East Texas and Northwest Louisiana. The volume of produced oilfield wastewater was largely due to increase brine production associated with the Haynesville Shale play. Injection of the increasing volumes of produced brine into Class II disposal wells in East Texas caused documented pressure increases in some geologic formations, primarily the late-Cretaceous Rodessa Formation. RRC records indicate that many production wells in East Texas lack cement between the well casing and Rodessa Formation; this cement void may provide a pathway for pressure transfer into another zone. Such pressure transfer likely caused the observed high bradenhead pressures in some production wells in the area.

In 1991, EPA first authorized the disposal of restricted hazardous waste into a Class I hazardous disposal well at the current Pergan Marshall LLC facility near Marshall in Harrison County, a county in the East Texas area of focus. An exemption to hazardous waste land disposal restrictions is required under Section 3004 of the Resource Conservation and Recovery Act (RCRA) and authorized through UIC regulations at 40 CFR §148. As early as 2006, annual pressure fall-off well tests that monitor pressure changes began to show a significant increase in formation pressure in the Pergan Marshall disposal well. In 2014, the pressure fall-off tests

showed pressures non-compliant with EPA-approved operating conditions, and in September 2014, EPA published its denial decision for continued operation of the Pergan Marshall Class I hazardous disposal well (included in FY2016 evaluation). During the time of the observed significant increases in the Pergan Marshall Class I well, a large number of Class II wells in Harrison County were also permitted to dispose of produced brine into the Rodessa Formation. EPA believes the recorded pressure build-up in the Rodessa Formation in East Texas is a direct result of authorized Class II disposal.

As early as 2012, the RRC documented an increase of bradenhead pressure for a large number of production wells in a three county area in East Texas: Harrison, Panola, and Shelby. Subsequently, RRC's Oil and Gas Division requested bottom-hole pressure (BHP) data from operators of 86 commercial disposal wells in those East Texas counties. In April 2014, the RRC modified permitted injection pressures for many of those wells and required continuing annual pressure fall-off testing and BHP monitoring to assure protection of underground sources of drinking water. RRC reported the BHP data received and analyzed ranged from approximately 0.106 pounds per square inch per foot of depth (psi/ft) to 0.92 psi/ft. Most of these data are from disposal in the Rodessa Formation for which a salt water gradient of 0.46 psi/ft is often used by the RRC. Based on historical and the new operator data including pressure fall-off test reports, the RRC found areas with elevated BHPs and areas where pressure is not a problem, but no clear trend has emerged.

RRC staff are using all available data when reviewing new disposal well applications for both commercial and non-commercial Class II disposal wells in the three county area. Factors considered by RRC in permitting new disposal wells include:

1. The construction and completion of all wells within a ½-mile area of review,
2. The BHP of the proposed disposal formation, if available, and
3. The proposed injection rate of wastewater, both volume and pressure.

Permits have been issued for some wells where application data indicate that pressures will not be a problem; those permits contain special monitoring and reporting conditions that will help the RRC determine how formation pressures change over time. During State FY2016, the RRC did not deny any disposal well permits in the three county area of concern in East Texas. However, operators either withdrew applications or did not respond to RRC requests for additional information on at least thirteen applications. The RRC will continue to update Region 6 on this issue of concern

### **Section 4.3 Identification and Delineation of Aquifer Exemptions, Pre and Post-Primacy**

EPA's FY2015 evaluation included the historical background of the RRC's approved UIC program related to Class II aquifer exemptions. RRC received additional UIC grant funds during FY2017 to query the RRC electronic databases for aquifers that may produce hydrocarbons from USDWs with the goal of identifying aquifers that existed at program primacy, therefore

previously exempted from SDWA protection. RRC and Region 6 managers continued a dialogue on this matter through meetings in Austin and phone calls. RRC reported the effort is very resource intensive and staff continue to gather information in their records. RRC also requested additional funds from EPA to extend their initial database project (scanning of H-5s, MIT reports), which were granted in late 2016. RRC anticipates completing the effort in the summer of 2017. Once the RRC completes its records search, EPA anticipates further actions by RRC that document the areas of historical exemption. EPA recommends continued high prioritization of this effort to identify fields that may produce hydrocarbons from aquifers. RRC is commended for its intensified efforts to address possible injection into aquifers.